REMARKS

All of the original claims (1-21) have been cancelled and new claims 22 through 30 have been added.

The 35 USC 112 Rejection

Claims 1-21 were rejected under 35 USC 112, second paragraph for indefiniteness. The new claims have language which eliminates any indefiniteness of the original claims. For example, original language regarding the length of time liquid water does not circulate was deemed indefinite because "a step, or conditions for circulating liquid water are not recited, it is indefinite how long the anti-freeze should circulate." The two new independent claims, 22 and 28, now state that in the method for operating a fuel cell system, at the time of start-up....."there is insufficient liquid water within the water circulation system to enable the circulation of water...". In claim 22, step (a) includes "accumulating liquid water during stack operation until there is sufficient liquid water to enable circulation of liquid water.....and thereafter circulating that water...". Step (c) then calls for "allowing the stack operating temperature to increase.....after water circulation.....has begun." There is clearly no indefiniteness in this new claim language.

The examiner also deemed the language "normal operating temperature" and "normal stack operating temperature used in several claims to be indefinite. This language no longer is used in any of the claims.

In now cancelled claim 7 the phrase "sufficient liquid water" was deemed indefinite "because the purpose for which water should be 'sufficient' are not defined." Claim 22 step (a) now requires "accumulating liquid water during stack operation until there is sufficient liquid water to enable circulation of liquid water through the cell water flow passages". (emphasis added). As set forth earlier in that claim, prior to start-up "there is insufficient liquid water within the water circulation system to enable the circulation of water.." the new language clearly satisfies 35 USC 112 2nd paragraph.

The other language deemed indefinite, namely the language of now cancelled claim 8 which stated "when ambient temperature may be below the freezing point of water", and

in cancelled claim 11 the language "wherein sub-freezing temperatures are expected..." is no longer used. Claim 22 now simply requires that "at the time of start-up, the stack has frozen water therein...". And claim 28 is simply "The method for operating a fuel cell system under freezing conditions....".

In sum, the claims now in the case all satisfy 35 USC 112, 2nd paragraph.

The 35 USC 102(e) Rejection

Now cancelled claims 1, and 3-5 were rejected under 35 USC 102(e) as being anticipated by Thompson et al. New independent claims 22 and 28 clearly distinguish and are patentable over that reference and all other cited references. Applicants' fuel cell system to which the method of the present invention applies is a system that includes a water circulation system for accumulating water and circulating that water through the water flow passages that pass through each cell. In claim 22 the method is for starting up the stack when water is frozen within the stack. In step (a) the stack is started by operating on non-humidified reactants to melt the frozen water "until there is sufficient liquid water to enable circulation of liquid water through the cell water flow passages, and thereafter circulating that water through the water flow passages to provide humidification for the cells." Note that the system of Thompson et al does not have nor use a water circulation system through water flow passages through the cells to humidify the stack. It only discusses the use of an external humidifier to humidify reactants before they enter the cells. Even more importantly, in Applicants' invention step (b), at a stack operating temperature above 0°C, the antifreeze is circulated through the stack cooler "to prevent the operating temperature of the stack from increasing beyond a preselected temperature during the period of operation of the stack prior to the step of circulating the water, said preselected temperature being selected to prevent the cells from drying out during said period of operation". Further, in step (c), the operating temperature of the stack is allowed to increase to above the preselected temperature after water circulation through the water flow passages has begun. In Thompson, et al, in addition to there being no water circulation system for humidifying the cells, There is no step of initiating and maintaining antifreeze circulation to prevent the operating temperature of the stack from increasing beyond a preselected temperature during the time no water is circulating.

Thompson et al merely starts antifreeze circulation at a temperature of 50°C. there is no attempt to maintain the temperature below a preselected temperature for any period of time. There is no need for Thompson et al to do so since in the Thompson et al system an external humidifier, which operates starting at a 5°C stack temperature, provides continuous humidification of the entering reactants.

In Applicants' claim 23, there is the further limitation that "the stack operating temperature is allowed to increase to said preselected temperature before antifreeze circulation is initiated and the antifreeze circulation maintains the stack operating temperature at said preselected temperature until water circulation through the water flow passages has begun." (This is specifically represented and explained in conncetion with Applicants' Fig. 2.) Although Thompson et al starts its antifreeze circulation at a preselected temperature of 50°C they do not then maintain that temperature until water circulation begins.

In dependent claims 24-26 further limit the method by requiring preselected temperatures of "no more than about 40°C" (claim 24) and "between 30°C and 40°C" (claims 25 and 26). Dependent claim 27 requires that after start-up the operation of the stack is used to melt frozen water in the accumulater of the water circulation system.

From the foregoing, it is clear that new independent claim 22 and claims 23-27 that are dependent therefrom clearly distinguish over and are not obvious from Thompson et al.

Independent claim 28 states in the preamble that at the time of start-up there is insufficient liquid water within the water circulation system to enable the circulation of water. Step (a) requires "starting up and operating the stack by introducing non-humidified reactants into the cells.....to increase the stack temperature to a preselected temperature above 0°C." Step (c) requires: "preventing the circulation of water through the water flow passages throughout operation of the stack and allowing water produced by the stack to accumulate within the water flow passages during operation.." (emphasis added). And step (d) requires: shutting down the stack and, upon shutdown, draining liquid water from the cell water flow passages before it freezes." Thompson et al neither shows nor suggests water flow passages through

the cells, nor the allowing of those passages to fill with liquid during operation of the stack while preventing circulation of the water accumulating therein throughout stack operation. Dependent claim 29 (and claim 30 which is dependent from claim 29) provides further differentiation by restricting the temperature of the stack to no greater than 40° C throughout its operation from start-up to shut-down.

The prior art made of record and not relied on neither anticipates nor renders obvious that which the applicants deem as their invention.

In view of the foregoing, examination and allowance of new claims 22-30 is respectfully requested.

Respectfully submitted,

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